Theoretical analysis of Smith-Purcell radiation from 2D photonic crystal of dielectric spheres

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Based on the multiple multi-pole scattering theory, analysis is presented of light emission in the millimeter region when a high energy electron beam passes above a 2D photonic crystal made of dielectric spheres. Good agreement is achieved between calculated and experimental results. It is clarified that emitted light consists of the umklapp scattering process (Smith-Purcell radiation) as well as a direct excitation and propagation of photonic band states within the photonic crystal due to the existence of sample edge.

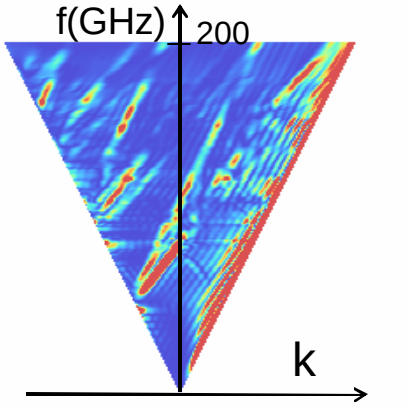

Fig. 1 Directional intensity distribution of emitted light within the light cone. Intensity increases from blue to red.

[1] K. Yamamoto et al., Phys. Rev. E **69**, 045601 (2004).